Safe Transport of Containers by Sea

Industry Guidance for Shippers and Container Stuffers

International Chamber of Shipping

WORLD SHIPPING COUNCIL
PARTNERS IN TRADE

Supported by

GLOBAL SHIPPERS' FORUM

Safe Transport of Containers by Sea

In December 2008, the International Chamber of Shipping (ICS) and the World Shipping Council (WSC), published 'Safe Transport of Containers by Sea: Guidelines on Industry Best Practices'.

The Guidelines have been produced to minimise the dangers to containerships, their crews, and all personnel involved with containers throughout the transport chain, and were developed by an expert industry working group, meeting in London and Washington DC during 2008. The Guidelines have now been presented to governments at IMO where they have been well received. Encouragingly, the Guidelines have also attracted a positive response from shippers' organisations who, under the umbrella of the Global Shippers Forum (GSF), have lent their support to this brochure.
The primary responsibility for the safe transport of containers by sea rests with containership operators. However, there are many other parties in the transport chain concerned with the safe movement of containers. There are those employed by shipping lines involved with the booking and assignment of cargoes, and the subsequent arrangements for stowage planning; and there are the freight forwarders, ports and terminal operators and - particularly important - the shippers, from whom the cargo originates. All of these players have important responsibilities which are addressed by the Industry Guidelines.

Particular emphasis is given by the Guidelines to the responsibilities of those involved with the correct packing, labelling and weighing of cargoes when they are stuffed into containers, and the accurate declaration of goods by cargo interests.

All of these activities have a direct bearing on the safety of ships and the reduction of the risks to the lives of ships' crews and other personnel in the transport chain.

The following advice is an extract from the main guidance on shippers' responsibilities addressed in the 'Safe Transport of Containers by Sea' guidelines.

Comprehensive information on the safe stuffing and transport of containers can be found in the joint International Chamber of Shipping and World Shipping Council publication *'Safe Transport of Containers by Sea: Guidelines on Best Practices'*. To order, see back page or contact your maritime bookseller.

Industry Guidance for Shippers and Container Stuffers

1 Overview

This guidance is addressed primarily to shippers, although everyone involved in the transport of containers by sea, not least ship operators and crew, should be aware of the importance of stuffing containers safely and correctly, and the need to comply with international regulations and best practice procedures established by the industry. In the interests of protecting cargo, this is a matter of enlightened self interest.

It is of the utmost importance to recognise that actions taken when containers are stuffed may have direct implications for the stability and safety of containerships, the lives of seafarers on board and the safety of others throughout the transport chain.

It is particularly important for all involved to understand the high degree of physical risk presented by the marine environment, the extreme forces to which a ship is exposed at sea, and the extent to which these risks are greatly increased by any failure to stuff containers correctly. This point cannot be over emphasised.

It is vital to adhere to weight restrictions, and correct procedures for loading and securing cargo, to ensure the safe distribution of weight and that cargoes inside containers do not move or shift when at sea, compromising the safety of the ship.

The IMO/ILO/UNECE Guidelines on the Packing of Cargo Transport Units provides a common global resource for information on container stuffing.

2 Key Requirements

The following requirements must be adhered to during container stuffing/unstuffing, in addition to the more specific observations elsewhere in this leaflet:

• Subject to booking request, select the most suitable container type to accommodate the cargo;

• Prepare a pre-stow plan before commencing stuffing so that weight/volume considerations are covered and point loading limits are observed;

• **Never** load by weight above the payload limits of the container, i.e. the cargo and container net weight must not exceed the container's gross safe working load;

• **Never** load by weight above the road regulations applicable on the transit;

• Distribute the weight of the cargo evenly over the floor of the container. Never stow heavy items in one section and light items in another. The weight of the cargo should not exceed the *'60% within half the length rule'*;

• Do not stow heavy goods on top of light goods;

• Stow and secure all cargo tightly;

• Observe all the handling instructions on cargo such as "Do not drop" or "This side up";

• Stow goods with sharp corners separate from other softer merchandise. Use dividers and separating material as appropriate;

• Where possible with mixed loads, place packages containing liquid cargo on the bottom tiers with dry cargo on top;

• Use cargo liners for obnoxious cargo such as hides and carbon black;

• Do not use clamps or other loading devices unless the goods can withstand them;

• When loading Dangerous Goods, ensure that the IMDG Code packaging requirements are always observed;

• Do not load goods in a container with damaged packaging;

• Do not stow wet and damp goods with dry goods;

• Do not use dunnage or packaging which is incompatible with the cargo;

• Do not stow goods with tainting odours with sensitive merchandise;

• Observe all rules concerning dangerous cargo. Use appropriate labels and placards to identify packing and freight containers loaded with Dangerous Goods;

• Stow hazardous cargo near the door where possible;

• Include all necessary documentation;

• Record the seal number and the container number on all shipping documents;

• Never smoke, eat or drink during loading or unloading.

3 Checking the Container

In most operational regions, containers are inspected when they return after import but not again when they are released for export. There will also be instances of triangulation moves when the container is driven by truck straight from the import customer to the export customer. In such cases, the container will probably have only received a quick sweep out and check for damage by the haulier.

A full container inspection for structural damage requires a competent and trained person. However, checking for cleanliness and general acceptability is a matter of common sense. It is very much in the interests of any user, regardless of whether the container is being stuffed with a full load, to carry out a quick internal and external inspection prior to stuffing (and also after unstuffing the container).

The following useful checklists should assist the examination of containers during cleaning, loading and unloading, to help minimise cargo damage and reduce risks to personnel. At all times, it is necessary to adhere to the IMO/ILO/UNECE Guidelines for Packing of Cargo Transport Units.

3.1 Pre-Stuffing

Prior to stuffing, a number of checks should

be made on a container both internally and externally to ensure that it is structurally sound, and safe to work in and around.

Dated and digital photographs of the interior and exterior of the container should be taken.

3.1.1 External Checks

Before a container is opened, it should be ensured that it possesses a valid Container Safety Approval Plate and that the re-examination date has not passed. Once this has been established, the following aspects of the container's exterior should be assessed before it is opened or entered:

• **Holes:** No obvious holes or tears in the exterior panelling;

• **Doors:** No broken or distorted door hinges, locks, or door seal gaskets;

• **Tilts (Tarps):** Where containers are fitted with removable roof tilts (tarps) or side curtains, they should fit correctly, be equipped with tilt wires and have no tears in the fabric;

• **Roof bows:** Open top containers should have all the roof bows (supports) in place. If the roof is of the retractable sort then the roof bows should slide smoothly to the ends of the container;

• **Placards and Markings:** Any placards or markings remaining on the outside of the empty container which refer to the previous cargo should be removed;

• **Structure:** No serious structural defects such as torn or cracked corner fittings or side rails (IMO CSC/Circ. 134 contains guidance).

3.1.2 Internal Checks

Once the external elements of a container unit have been agreed to be of a suitable standard, the container may be opened in order that the following checks can be made:

• **Clean:** No leftovers (sweepings, dust, grease or liquid) of the previous cargo;

• **Dry:** The interior should be dry and free of any sweat or frost;

• **No infestation:** There should be no evidence of pests, insects or rodents which might contaminate cargo and lead to delay by port health authorities;

• **Taint free:** If delicate goods susceptible to damage by bad odours are to be packed, then the container should be "sweet" smelling. This should be checked immediately on opening the doors when any lingering smells will be at their strongest. Caution must be exercised in case there are obnoxious gases from cargo previously stowed in containers, particularly where fumigation may have been used;

• **Watertight:** This is best checked by entering the container and closing both doors. If any spots of light can be seen then water can gain entry. This also applies to the container floor because water can splash upwards during road haulage;

• **Follow instructions:** Any recommendations posted inside the container should be noted.

3.2 Post Stuffing

When the planned quantity of goods has been stuffed in a container, the following checks should be made:

Restraint: The goods should be arranged and secured to withstand the normal stresses and strains of the journey. In particular, ensure doorway cargo cannot move;

Customs inspection: If more than one type of article is stuffed in the container, it may save time and the cost of a search if a sample of each article is positioned near the door;

Security: When the doors are shut, all securing lugs should be properly engaged forcing the door seals into compression. The company's approved seal should be fitted in the appropriate position on the right hand door and the number noted. Seals should comply with ISO standards;

Contents: Any placard, except those required by regulation, on the outside of the container advertising the contents will attract thieves and should be removed. Any packages of Dangerous Goods should be labelled according to the IMDG Code;

Placards: DG Placards, if appropriate, should be affixed in the recommended positions. The placards must be placed in such a way that they do not obscure the number of the container or other distinguishing marks.

3.3 Prior to Unstuffing

The following should be checked prior to unstuffing:

Security: Seal is intact and has not been tampered with. The number must be compared with the accompanying documents for possible future reference;

External condition of the container: Any damage that may have affected the content should be duly noted;

Placards and markings: Before opening the doors, due regard should be taken of any placards and markings such as DG labels or contents shipped in bulk;

Doors: The doors should be opened cautiously and retaining straps attached to the locking bars to avoid harm to individuals. This is to guard against the risk of improperly secured cargo falling out and harming personnel. Once the doors are open, the container should be allowed to 'air' for a period of time to ensure that no hazardous gases or fumes are present which could affect persons entering it.

3.4 Checklist after Unstuffing

When a container is empty of cargo, the container should be checked for damage that might lead to claims. Most tariffs are so worded that it is obligatory for full container load customers to clean out the container after unstuffing. This includes removal of all packaging and a thorough sweep out.

It is prudent to examine the container for any signs of wet stains and holes in the sides or roof that might have affected the cargo which has just been carried. Labels and placards should be removed when the container is empty.

4 General Stowage

4.1 Homogeneous Cargo

If the load consists of homogeneous cargo (and all the cargo is the same size) the total volume of the container should be utilised.

Different kinds of packaging methods exist such as cartons, boxes, bags, drums and barrels, rolls, liners for liquid bulk and small wooden crates. The container may have vacant space left on completion of stuffing due to weight restrictions or otherwise, and sensible securing is necessary on grounds of safety and cargo care.

Bagged cargoes with a high moisture content, such as cocoa beans or coffee beans, may require dressing of the container ceiling and walls with moisture/condensation absorbing paper, and the hanging of so called Moisture Absorbing Materials (MAMS) bags in the container's corners.

4.2 Uniform Stowage

When cargo is stowed into a container and free space is unavoidable, the cargo must be stowed in such a way that there is a gap in the middle of the stow. The gap, which can be fore and aft or athwart the container, must be chocked with wood or lashed with rope and, if the cargo is fragile, nets or dunnage bags must be used.

4.3 Carton and Packages

It is important to follow any instructions printed on the cartons, e.g. particular side up for bottles of wine which require corks to

remain immersed. To ensure stability in the stow and spread the weight as evenly as possible a "Bonded Block Stow" should be used.

4.4 Bagged Cargo

Bagged cargo tends to settle during transit causing pressure on side walls. Normal practice is to stow bags in interlocking stows. Bag on bag or building air chimneys within the stow may be necessary where extra ventilation is required.

To avoid the risk of bags falling out of the container when the doors are opened, a brace or net should be placed against the final row. Bags that are stowed and secured on pallets do not cause this problem and the cargo can be handled much faster.

4.5 Drums and Barrels

Drums and barrels in containers should always be stowed upright if possible. If the bung or closure is at one end, then it should be stowed with the bung uppermost.

Barrels of earthenware etc should always be stowed upright.

Unless the drums or barrels are specially designed to "nest", there should be some form of soft dunnage or ply between each tier of drums. Dunnage should be laid sufficiently close to provide full support to the tier above.

Rolling hoops, when pressed out of the side walls of the drums, are particularly susceptible to rupture through chafing. In some instances, it may be necessary to lay dunnage between individual drums to prevent rolling hoops from chafing one another. A second option is that each alternate row of drums may be lifted a few centimetres with carefully laid dunnage, allowing the rolling hoops to ride clear and reducing the effective diameter of each drum.

Cargo behind the doorway should be properly secured with a fence, net or lashing.

4.6 Rolls

When rolls are stowed upright, they should be packed closely together. Any empty spaces between the rolls should be filled in by sacks of sawdust, corrugated cardboard or similar soft dunnage. The rolls should be secured by means of timber, nets or wedges.

When the rolls are stowed horizontally, the rolls which are nearest to the door should be secured by wedges or other similar devices. Support the rolls evenly along their length on a flat surface particularly with cargo such as carpets.

Rolls of paper require paper clamps for careful handling.

4.7 Bulk Liquids

Wine, latex, printing ink and other non-hazardous liquids are often transported in strong synthetic "flexi-bags" in 20′ general dry containers. The bags must be braced at the door end of the container with a strong steel (or other material) bulkhead.

It is important to make sure that the harness straps on the bags are secured tightly to the anchorage rings in the container. It is not only necessary to secure the load but also to make sure the pressure on the walls is not too high (if so, the pressure must be distributed with planks or plates).

Containers with corrugated side panels should be used. Bottom valves, if any, of the flexi-bag must be enclosed and secured by the bulkhead panel, to protect against shifting and bending during transport, which can tear the bag.

4.8 Bulk Solids

Bulk bags are used for a wide range of granular substances including malt and coffee. Care should be taken to ensure that the cargo does not exceed the design parameters of the container.

4.9 Hanging Garments

Specialist containers are available for shipping clothing. Failure to observe proper preparation and stowage procedures can result in considerable claims for dry cleaning of garments which may have dropped to the container floor.

4.10 Reefer Cargoes

Hot stuffing of containers (warm cargoes in cooled containers) should be avoided, and the cargoes should thus be pre-cooled. Reefer cargoes must be stowed in such a manner as to allow optimal circulation of cold air. For example, stowage of cartons or other packages up to the container ceiling will prevent optimal air circulation and therefore optimal cooling.

5 Safety and Securing

This section identifies important issues of safety that have been experienced with containerised cargo and the related subject of cargo securing.

5.1 Overloading

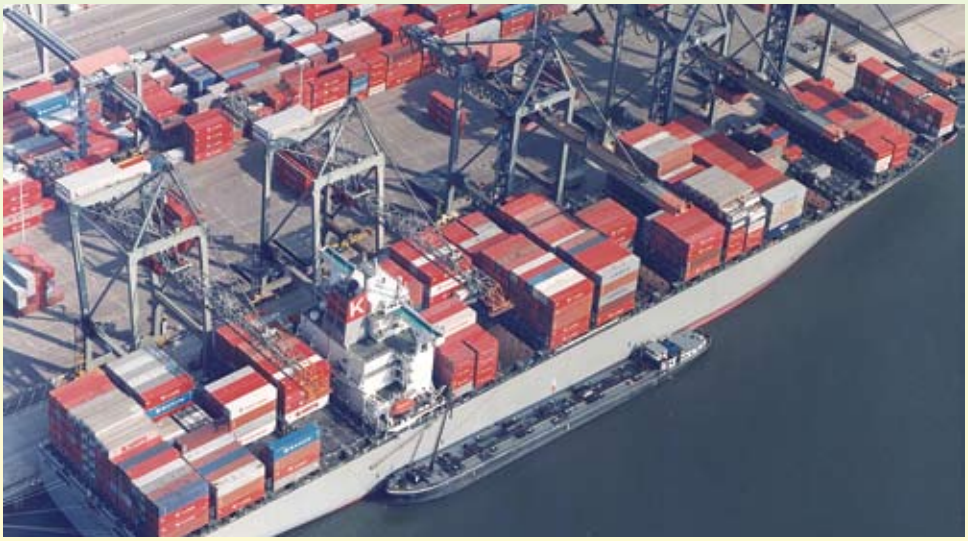
There have been many incidents over the years of containers being loaded above their stipulated payload. This can seriously affect stability and the safety of any ship carrying the cargo when it is underway at sea.

In many cases the manifests declare cargo within payload limits when it is over the limit. This is often exposed by the suspicions of a container handler or even following an accident resulting in a weighbridge check.

Overloading is something which can NEVER be condoned and when accepting cargo the following should always be obtained or checked. The party stuffing the container is responsible for ensuring that:

- The number of pieces, size, weight and volume of any commodity is obtained;
- The payload and volume of the container selected/requested is compared with the cargo particulars to establish whether a weight or volume restriction applies;
- The gross mass of the container is in accordance with the gross mass given on the shipping documents.

Where a weight restriction applies, the point



loading of cargo must also be checked in order that the tonnes per square metre loading limit is not breached. Cargoes such as metal ingots come into this category and timber often requires the weight to be spread.

Extremely dense cargo can overload a small area of a container's floor causing it to fail. For extremely dense cargo, or cargo that puts a high load into a small area of a container's floor, timber or other dunnage must be used to spread the weight over a larger floor area.

As a rule of thumb, floor loading should not exceed 2,500 lb per linear foot of the container or a maximum of 1.5 tonnes per floor supporting cross member.

5.2 Road and Rail Limits

Apart from the immediate dangers to the safety of ships created by overloading, the gross weight of the container (cargo plus container tare) must not breach the applicable road or rail limits on all legs of the transit journey. The importance of observing these limits cannot be overstressed.

5.3 DG

In the interests of safety, it is essential to ensure the following with respect to the stowage of Dangerous Goods within a container:

- The cargo must be declared to the appropriate dangerous cargo department;
- All documentation must be completed, signed and accurate;
- Individual packages of DG must be labelled;
- The container must be properly placarded with appropriate placards, marks and signs, as determined by the IMDG Code, affixed to the outside walls of the container as specified by the Code;
- The relevant IMDG stowage segregation requirements must be complied with at all times.

5.4 Shifting Cargo

The incidence of cargo moving inside a container during transit is considerable. This is usually because the cargo has not been secured properly, or the packaging is defective. Apart from the serious risks to ships and the stability of container stacks, several cases have been recorded where road vehicles have turned over due to cargo moving, when negotiating bends. The key issue is to secure cargo efficiently to prevent the initial movement.

Although containerised cargo is well protected, it is still subject to the constant movement and stress of maritime transport. In heavy seas, the cargo is exposed to compressive forces due to pitching and rolling. These forces may increase the normal strain on lashings, struts and other securing devices by as much as 100%. Effective securing of the load throughout the entire transport process is therefore of absolute importance.

5.5 Securing in Containers

The cargo in containers needs to be stowed in such a way that the cargo cannot move. The container itself is designed to permit tight, secure stowage of cargo either through compact loading or individual securing. These facilities include:

- Floor of wood or plywood which permits blocks, stays and wedges to be anchored with nails or screws;
- Internal walls, for the support of light cargo only;
- Corner posts which are suitable for bracing to with timbers and by using lashing points provided inside the container;
- Lashing points are located along top and bottom rails of the container at regular intervals.

Example for a typical 20′ container's lashing facilities:

Location	No of lashing points	Rating kg
Side wall (base)	5	2,000
Side wall (top)	5	500
Front (base)	1	500
Rear (door recess area)	5	500

It should be noted that the walls, doors and roof of a container are merely a protective shell that cannot withstand concentrated stress. If the walls or ceiling are used for lashing purposes, the stress on the walls or ceiling must be evenly distributed.

5.5.1 Securing Materials

Most types of cargo can be secured using the following materials (though precautions should be taken to ensure that they are not forbidden for import into the cargo's country of destination):

- Timber beams, struts, chocks, planks for shoring, bracing and relieving pressure;
- Adjustable wooden battens, rods or strap belts for securing the load in sections, facilitating mechanical discharge;
- Plywood and dunnage to separate several layers of cargo or to segregate different types of cargo into separate sections;
- Foam-rubber cushions and air bags to reduce vibration and prevent the load from shifting;
- Second hand tyres or bags with paper waste or sawdust to fill empty spaces, soften the impact and prevent shifting;
- Nets to secure fragile goods;
- Rope (hemp, manila, sisal, etc), wire, steel bands and terylene straps for lashing;
- Nylon span sets;
- Bolt clips into T section flooring in insulated containers;
- Bulkhead bars.

5.5.2 Securing calculations aboard ship:

As shown in Figure 1, forces acting in a seaway are:
Rotational:
Rolling;
Pitching;
Sheering/Yawing.

Linear:
Swaying;
Surging;
Heaving.

Calculations for securing against the above forces follow a prescribed discipline and it is important to refer to this procedure when performing calculations. The recognised calculations are contained in the IMO Code of Safe Practice for Cargo Stowage and Securing (CSS Code).

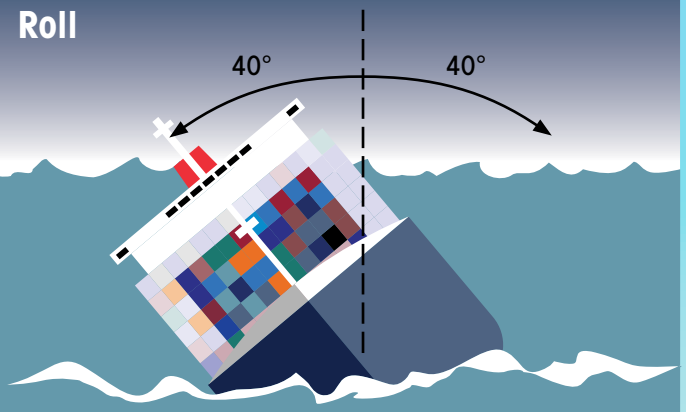
6.6 Final Weighing of Container

After finalisation of stuffing and securing of containerised cargo, the total container weight must be verified and documented.

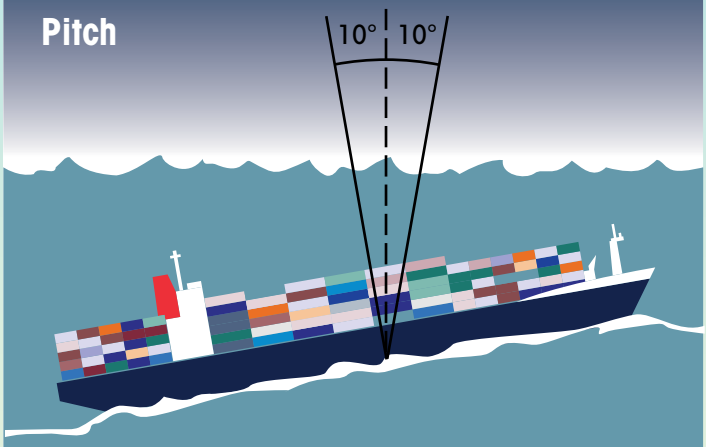
Ship Motions in a Heavy Seaway

Rotational

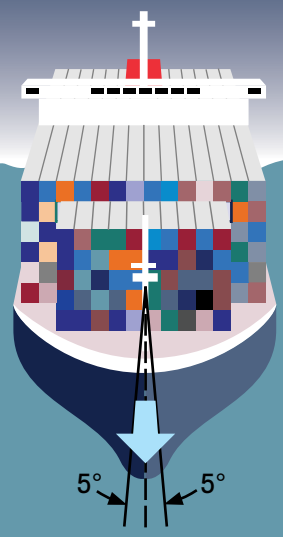
Roll



Pitch



Yaw



Momentary deflection from projected course

Linear

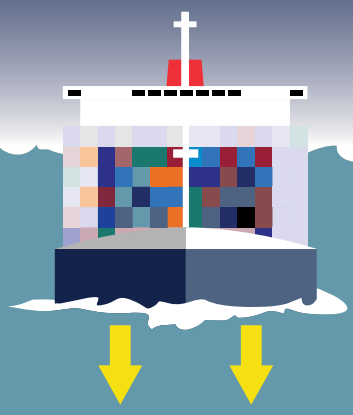
Sway

Brief sideways motion along slope of sea surface

Surge

Brief additional forward motion due to rise and fall of sea surface

Heave



Brief vertical motion due to rise and fall of sea surface

Please photocopy and send this form whenever you wish to order a publication.

Marisec Publications Order Form

All publications, should be ordered by sending this form to:

Marisec Publications
12 Carthusian Street, London, EC1M 6EZ

Tel +44 20 7417 2855/8844
Fax +44 20 7417 8877

E-mail publications@marisec.org
www.marisec.org

Bulk Order Discounts

20% discount for orders of 50 or more copies of the same publication or for any order exceeding £750.*

30% discount for orders of 100 or more copies of the same publication.*

Date of order | Order No.

Invoice to | Deliver to (if different from the invoice address)

Telephone | Fax

E-Mail

Publication Title	Unit Price (£)	Quantity	Order Price (£)
Safe Transport of Containers by Sea	£80		
Total (minus bulk order discount if applicable)			**£**

Payment Details

Marisec Publications require pre-payment on all publication orders.
Please arrange payment by one of the following methods:

☐ Bank transfer (details will be forwarded on receipt of order)

☐ Cheque enclosed for **£**

Cheques should be expressed in Pounds Sterling, drawn on a bank in the UK and made payable to *'Marisec Publications'*

☐ Please debit my Maestro/Visa/Mastercard/Amex for **£**

Name of Cardholder | Signature | Date

Address of Cardholder (if different from the invoice address)

Card Number ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ Security Code ☐☐☐

Start Date ☐☐/☐☐ Expiry Date ☐☐/☐☐ Issue No. (Maestro only) ☐☐

Remember, prices for products ordered direct from Marisec Publications include worldwide airmail postage**

* Bulk order discount excludes ICS Tanker Guides (Chemicals and Liquefied Gas), ISF/Marlins products, ISF Watchkeeper software, Personal Training and Service Record Books, and On Board Training Record Books, for which special prices already apply. ** Free postage excludes Tanker Safety Guide (Chemicals) and Tanker Safety Guide (Liquefied Gas).